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BUREAU OF ANIMAL INDUSTRY.—CIRCULAR 151.

A. D. MELVIN, CHIEF OF BUREAU.

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COMPETITIVE EXHIBITIONS OF
MILK AND CREAM,

WITH REPORT OF AN EXHIBITION HELD AT
PITTSBURG, PA., IN COOPERATION WITH
THE PITTSBURG CHAMBER OF COMMERCE.

BY

C. B. LANE AND IVAN C. WELD,
Of the Dairy Division.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., July 20, 1909.

SIR: I have the honor to transmit herewith and to recommend for publication as a circular of this Bureau a manuscript entitled "Competitive Exhibitions of Milk and Cream, with Report of an Exhibition held at Pittsburg, Pa., in Cooperation with the Pittsburg Chamber of Commerce," by C. B. Lane, senior dairyman, and Ivan C. Weld, assistant dairyman, of the Dairy Division of this Bureau.

The first competitive exhibition of milk and cream was held under the direction of the Dairy Division in connection with the National Dairy Show at Chicago in 1906. Since then a number of others have been planned and carried out in different parts of the country in cooperation with local authorities. The present paper deals more particularly with one held in Pittsburg, Pa., under the auspices of the Chamber of Commerce of that city.

These public exhibitions and the meetings held in connection therewith have proved to be of great educational value to the dairy interests of the country, and they have given a decided impetus to the movement for the improvement of the milk supply, especially in the large cities.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.



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COMPETITIVE EXHIBITIONS OF MILK AND CREAM.

THE FIRST NATIONAL MILK AND CREAM EXHIBITION.

The first public milk and cream exhibition for prizes in this country was held in connection with the National Dairy Show in Chicago, under the direction of the Dairy Division, Bureau of Animal Industry, United States Department of Agriculture, February 15-24, 1906. The objects were, first, educational; second, to determine the possibilities in the handling and keeping of milk and cream produced under sanitary conditions and kept cold; and third, to test a score card for rating fairly and accurately this class of dairy products.

Much interest was manifested from the beginning, exhibits being sent from thirteen different States. The results were most gratifying, one of the most striking being the demonstration of the fact that clean milk, held at a low temperature, could be shipped a thousand miles across the country and kept sweet for a period of over five weeks. It was further demonstrated that milk and cream could be scored with reasonable accuracy for flavor, chemical qualities, keeping qualities, etc., on the score-card plan as applied to butter and other products.

A full report of this exhibition was given in Bulletin 87 of the Bureau of Animal Industry.

STATE EXHIBITIONS.

Since the national contest was held several States have had similar exhibits in connection with the State dairy association meetings. Among them may be mentioned New Hampshire, Pennsylvania, Maine, Vermont, Connecticut, Illinois, Kentucky, Michigan, Ohio, and Massachusetts.

These contests have proved of great benefit to dairymen, particularly in pointing out defects in the product and in the styles of bottles used, and suggesting remedies for the same. One of the most common defects in milk, and one which can be readily seen, is the foreign matter in the bottom of the bottle, consisting usually of particles of manure, hair, bedding, etc. This indicates careless and uncleanly methods in production and handling. Another common defect is found in off-flavored milk, and this may be due to a variety of causes, as (1) strong-flavored feeds, such as turnips, garlic, etc.; (2) feeding certain feeds to excess, as, for example, silage; (3) odors of silage or manure in the stable; (4) particles of manure and dirt getting into the milk, and (5) not properly rinsing the bottles after

using washing powders. Dairy men as a rule have been quick to see these defects when pointed out and to appreciate the importance from a business standpoint of producing milk as nearly perfect as possible.

THE FIRST CITY MILK EXHIBITION.

In view of the success of the national exhibition and those of several States, it was thought that the plan might be applicable to cities. Steps were therefore taken to give it a trial. The city of Cleveland, Ohio, had already adopted the Dairy Division score card for rating dairy farms, and as this city was making a special effort to improve conditions in the dairies and the quality of its milk supply, arrangements were made with the Chamber of Commerce to conduct a competitive exhibition under its auspices. This organization looked after the printing of the entry blanks, score cards, and letters to dairy men, and mailing the same; and furnished the hall for the meetings and the laboratory space for the chemical and bacteriological work. It also offered medals for the best exhibits of milk and cream, and the most sanitary dairy farms, and furnished two of the judges. The Dairy Division performed the chemical and bacteriological work and supplied the other two judges. Some 400 producers of milk for the Cleveland market were present at an all-day conference, when addresses on timely subjects were given by representatives from the Department of Agriculture and the Cleveland Chamber of Commerce. Many questions were asked by the dairy men present, which resulted in valuable discussions.

There were three classes in the contest, as follows:

Class I. Market milk (raw): This comprised all milk not "certified" or sold under any guaranty as to its quality. A very large percentage of the milk supplied to our cities is of this character. It was specified that the milk in this class must not be pasteurized or contain any preservatives.

Class II. Market cream (raw): It was specified that this product should be sweet, unpasteurized, and free from preservatives.

Class III. Dairy farms: All dairy men having exhibits of milk or cream in the above classes were permitted to enter the dairy-farm contest. These farms were visited by the judges and scored on the basis of a score card (see page 13). The results of this contest were published as Circular 117 of the Bureau of Animal Industry.

The first contest in Cleveland proved so valuable to the dairy men that a second contest was held March 7, 1908, on a similar basis. The dairy meeting in connection with it was even better attended than the first.

THE EXHIBITION AT PITTSBURG, PA.

A very successful exhibition was held in Pittsburg, Pa., in October, 1908, under the auspices of the Chamber of Commerce of that city,

and in cooperation with the Dairy Division of the Bureau of Animal Industry. This proved to be the largest and most enthusiastic exhibition so far held. There were 50 entries of milk and 11 entries of cream, while 20 dairymen entered the dairy-farm competition held at the same time. There were approximately 400 dairymen present at the meetings. This contest was conducted in practically the same manner as those held at Cleveland, except that some improvements were made in the entry blanks and score cards. This circular has therefore been prepared with the idea of presenting the best methods of conducting contests of this character.

CONDITIONS OF ENTERING.

The conditions of entry are set forth in the following entry blank, which was sent to dairymen with a circular letter inviting them to enter the competition and attend the meetings.

[Chamber of Commerce of Pittsburg. Dairy meeting and milk and cream contest, Pittsburg, Pa., Thursday, October 22, 1908, under the direction of the Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture.]

OFFICIAL ENTRY BLANK.

CLASS I. MARKET MILK (RAW).

P. O. Address: _____,

Date: _____, 1908.

C. B. LANE,

Assistant Chief, Dairy Division.

Please enter for me 4 quarts of milk to compete for prizes offered by the Chamber of Commerce of Pittsburg, October 22, 1908, in accordance with the conditions herein prescribed.

Rules: (1) Exhibitors are allowed to make only one entry in each class. This must include in Class I, 4 quarts of milk in 1-quart bottles, placed in a box suitable for shipping. (2) The milk to be the property of the United States Department of Agriculture. (3) Every exhibitor is required to fill out and sign the following certificate:

I, _____, hereby certify that the milk entered in this competition is a fair sample of the product sold by me, that it is free from preservatives, and that it has not been pasteurized or sterilized.

(Signed) _____,

(Proprietor) _____.

HOW TO COMPETE.

Milk to compete for prizes must be sent by express or otherwise, from station nearest the producer, direct to C. B. Lane, assistant chief, Dairy Division, care Pittsburg Chamber of Commerce, Pittsburg, Pa. Express charges on exhibits must be prepaid to destination.

The package should be plainly addressed on outside; a card should also be tacked on box inside, giving plainly sender's name and address, so as to avoid mistakes in identifying packages.

In order that the milk entered by the exhibitors may be of the same age when scored, it is hereby specified that it shall be drawn from the cow Friday, October 16, 1908, and shipped by express not later than the day following. This is necessary in order that the sample may be received in ample time for testing and scoring, which requires three days.

A representative of the Department of Agriculture will be on hand to take charge of the milk on its arrival and will see that it is properly cared for.

Only these official entry blanks will be accepted.

QUESTIONS TO BE ANSWERED BY EXHIBITORS.

1. Give date and hour when this milk was drawn from the cow: ———.
2. Give place, date, and hour at which this milk was delivered to the express company or otherwise shipped: ———.
3. Does this milk fairly represent the average product of your herd in quality and cleanliness? ———.
4. How was the milk treated from the time it was drawn from the cow until shipped? ———.
5. Do you wish to compete for the dairy-farm prize? ———.

(Only those dairymen entering in the milk or cream contest will be entitled to have their dairy farms scored for the dairy-farm prizes.)

(Signed) ———, ———.

JUDGES AND PRIZES.

It was arranged to give the products exhibited, as well as the dairy farms, in the contest the most careful examination possible, so that the final results would be beyond question, and it may be said that the dairymen generally expressed themselves as well pleased with the absolute fairness with which the contest was conducted. The judges were C. B. Lane and Ivan C. Weld, from the Dairy Division, and Doctors James F. Edwards and J. C. McNeil, from the health department of Pittsburg.

The Chamber of Commerce of Pittsburg offered very attractive gold and silver medals to the dairymen securing the highest scores. This feature increased the interest and stimulated keen competition. Medals were also awarded for the dairy farms having the best sanitary condition and equipment.

METHOD OF SCORING THE MILK AND CREAM.

The scoring was done on the basis of score cards similar to those used in previous contests. The judges experienced but little difficulty in this work; in fact, it was demonstrated that milk and cream can be graded as accurately as butter or cheese by the use of the score card, although the application of the system to milk and cream is comparatively new.

All the milk and cream entered in this contest was produced October 16 and shipped to a cold-storage house in Pittsburg. The scoring was done October 20, when the product was four days old. The score cards used in this contest are presented herewith.

[Front of score card.]

[United States Department of Agriculture, Bureau of Animal Industry, Dairy Division.]

SCORE CARD FOR MARKET MILK.

Exhibitor: _____.

Address: _____.

NUMERICAL SCORE.

Flavor, 40.	Composition, 25.	Bacteria, 20.	Acidity, 5.	Appearance of package and contents, 10.	Perfect score, 100.
					Judge's score.

DESCRIPTIVE SCORE.

Flavor.	Composition.	Bacteria.	Acidity.	Package and contents.
Excellent.	Perfect.	Perfect.	Perfect.	Perfect.
Good.	Fat.....per cent.	Total.....	..... per cent.	Foreign matter.
Fair.	Solids not fat.	Liquefiers.....		Metal parts.
Bad.	..... per cent.			Unattractive.
.....				
Flat.				
Bitter.				
Weedy.				
Garlic.				
Silage.				
Smothered.				
Manure.				
Other taints.				
.....				
.....				

Remarks: _____.

Date: _____.

[Reverse side of score card.]

_____, _____, Judge.

DIRECTIONS FOR SCORING.

FLAVOR.

If rich, sweet, clean, and pleasant flavor and odor, score perfect (40). Deduct for objectionable flavors and odors according to conditions found.

COMPOSITION.

If 3.25 per cent fat or above and 8.5 per cent solids not fat or above, score perfect (25). Deduct 1 point for each one-fourth per cent fat below 3.25 and 1 point for each one-fourth per cent solids not fat below 8.5.

BACTERIA.

Less than 10,000 per cubic centimeter.....	perfect..	20
Over 10,000 and less than 25,000 per cubic centimeter.....		19
Over 25,000 and less than 50,000 per cubic centimeter.....		18
Over 50,000 and less than 75,000 per cubic centimeter.....		17
Over 75,000 and less than 100,000 per cubic centimeter.....		16
Deduct one point for each 25,000 above 100,000.		

When an unusually large number of liquefying bacteria are present, further deduction should be made according to conditions found.

ACIDITY.

If 0.2 per cent or below, score perfect (5). Deduct 1 point for each 0.01 per cent above 0.2. (If Mann's test is used, discontinue adding indicator on first appearance of a pink color.)

APPEARANCE OF PACKAGE AND CONTENTS.

If package is clean, free from metal parts, and no foreign matter can be detected in the contents, score perfect (10). Make deductions according to conditions found.

The score card for market cream was identical with that for market milk, with the following exceptions: (1) The terms "lumpy" and "frothy" were added to the first column of the descriptive score, and (2) the directions for scoring "composition" were:

If 20 per cent or above, score perfect (25). Deduct 1 point for each one-half per cent fat below 20.

DETAILS OF SCORE MADE BY EACH ENTRY.

The composition, condition, and numerical scores of the entries of market milk and cream in the Pittsburg contest are given in the following tables:

TABLE 1.—Composition and condition of entries of market milk and cream.

MILK.

Sample No.	Fat.	Solids not fat.	Acidity.	Total bacteria per cubic centimeter.	Appearance of package.	Remarks.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>			
1.....	4.6	8.17	0.14	85,000	Much sediment.....	Gold medal.
2.....	3.4	8.68	.18	12,300	.....do.....
3.....	4.0	8.05	.18	17,500	.....do.....
4.....	7.0	7.9	.21	2,400,000	Slight sediment.....	
5.....	5.0	8.5	.22	1,000,000	.....do.....
6.....	4.6	8.42	.18	4,000	.....do.....
7.....	3.1	8.37	.16	2,200	.....do.....
8.....	4.4	8.13	.15	25,700	.....do.....
9.....	3.5	8.45	.14	470,000	.....do.....
10.....	3.6	7.97	.16	8,700	Much sediment.....	Honorable mention. Do. Do.
11.....	3.5	8.20	.15	5,000	Slight sediment.....	
12.....	3.4	8.18	.10	202,000	.....do.....
13.....	4.0	8.05	.17	27,600	Clean.....	
14.....	4.6	9.92	.14	100,000	.....do.....
15.....	5.0	9.25	.13	24,700	.....do.....
16.....	3.1	8.24	.18	37,000	Slight sediment.....	
17.....	4.0	8.42	.15	495,000	Much sediment.....	
18.....	3.4	8.43	.25	912,000	Slight sediment.....	
19.....	4.0	9.05	.16	14,500	Clean.....	Do. Silver medal.
20.....	5.0	8.87	.14	1,500	.....do.....
21.....	3.4	8.43	.15	8,000	Slight sediment.....	
22.....	4.0	9.3	.14	260,000	.....do.....
23.....	4.4	8.75	.16	87,000	Much sediment.....	
24.....	3.4	8.43	.16	300,000	.....do.....
25.....	3.5	8.32	.14	8,400	.....do.....
26.....	4.0	8.17	.16	40,000	Clean.....	
27.....	3.4	8.68	.17	8,000	.....do.....
28.....	3.0	8.22	.16	5,500	Much sediment.....	Honorable mention.
29.....	3.0	7.47	.14	205,000	.....do.....
30.....	3.3	8.28	.16	8,200	.....do.....
31.....	3.4	8.48	.14	4,600	Slight sediment.....	
32.....	3.4	8.3	.33	3,500,000	Much sediment.....	
33.....	4.0	8.67	.13	650,000	.....do.....
34.....	4.0	8.3	.17	5,300	.....do.....
35.....	4.0	8.3	.16	49,000	.....do.....
36.....	4.2	8.59	.17	21,000	Slight sediment.....	
37.....	3.6	8.97	.17	6,500	.....do.....

TABLE 1.—Composition and condition of entries of market milk and cream—Continued.

MILK—Continued.

Sample No.	Fat.	Solids not fat.	Acidity.	Total bacteria per cubic centimeter.	Appearance of package.	Remarks.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>			
38.....	3.6	8.09	0.14	25,000	Slight sediment.....	Honorable mention.
39.....	3.2	8.39	.14	537,000	Much sediment.....	
40.....	3.6	8.47	.16	15,000	Clean.....	
41.....	3.8	7.2	.16	11,000	Much sediment.....	
42.....	3.0	8.1	.14	10,000	.....do.....
43.....	4.0	8.55	.16	3,400	.....do.....
44.....	3.2	8.4	.18	610,000	.....do.....
45.....	3.1	9.12	.17	1,400	.....do.....
46.....	4.0	8.17	.17	445,000	Slight sediment.....	
47.....	3.8	8.51	.17	160,000	.....do.....
48.....	3.6	7.97	.15	3,300	.....do.....
49.....	3.8	8.26	.16	1,310,000	.....do.....
50.....	3.4	8.18	.15	650,000	Much sediment.....	

CREAM.

101.....	36.0	0.12	150,000	Much sediment.....	Silver medal. Gold medal.
102.....	30.0	.....	.27	2,500,000	Slight sediment.....
103.....	30.0	.....	.16	570,000	.....do.....
104.....	18.0	.....	.15	750,000	Much sediment.....
105.....	30.0	.....	.19	8,640,000	.....do.....
106.....	34.0	.....	.15	78,000	Clean.....
107.....	30.0	.....	.14	37,000	.....do.....
108.....	36.0	.....	.15	296,000	Slight sediment.....
109.....	30.0	.....	.32	(a)	.....do.....
110.....	28.0	.....	.15	(a)	.....do.....
111.....	36.0	.....	.19	(a)	Much sediment.....

^a These entries arrived too late for the bacterial count.

TABLE 2.—Numerical scores of the milk and cream.

MILK.

Sample No.	Flavor (perfect 40 points).	Composition (perfect 25 points).	Bacteria (perfect 20 points).	Appearance (perfect 10 points).	Acidity (perfect 5 points).	Total score (perfect 100 points).
1.....	34.5	25	16	8.5	5	89.0
2.....	34.0	25	19	6.0	5	89.0
3.....	33.0	25	19	9.0	5	91.0
4.....	33.5	25	0	9.5	4	72.0
5.....	33.0	25	0	9.5	3	70.5
6.....	36.5	25	20	9.0	5	95.5
7.....	33.5	24	20	9.5	5	92.0
8.....	33.5	25	18	9.5	5	91.0
9.....	35.5	24	1	9.5	5	75.0
10.....	34.0	23	20	8.5	5	90.5
11.....	35.0	24	20	9.5	5	93.5
12.....	32.5	24	11	9.5	5	82.0
13.....	37.0	25	18	10.0	5	95.0
14.....	36.0	25	15	10.0	5	91.0
15.....	34.0	25	19	10.0	5	93.0
16.....	35.0	24	18	9.5	5	91.5
17.....	34.5	25	0	8.5	5	73.0
18.....	30.0	24	0	9.5	0	63.5
19.....	35.0	25	19	10.0	5	94.0
20.....	34.0	25	20	10.0	5	94.0
21.....	35.5	24	20	9.5	5	94.0
22.....	31.0	25	9	9.5	5	79.5
23.....	34.5	25	16	9.0	5	89.5
24.....	35.0	24	7	9.0	5	80.0
25.....	33.5	24	20	9.0	5	91.5
26.....	36.0	25	18	10.0	5	94.0
27.....	35.25	25	20	10.0	5	95.25
28.....	36.5	23	20	9.0	5	93.5
29.....	33.0	20	11	9.0	5	78.0

TABLE 2.—Numerical scores of the milk and cream—Continued.

MILK—Continued.

Sample No.	Flavor (perfect 40 points).	Composition (perfect 25 points).	Bacteria (perfect 20 points).	Appearance (perfect 10 points).	Acidity (perfect 5 points).	Total score (perfect 100 points).
30.....	33.5	24	20	8.0	5	90.5
31.....	34.0	24	20	9.5	5	92.5
32.....	25.0	24	0	9.0	0	58.0
33.....	25.0	25	0	7.0	5	62.0
34.....	33.5	25	20	9.0	5	92.5
35.....	34.0	25	18	9.0	5	91.0
36.....	33.0	25	19	9.5	5	91.5
37.....	35.0	25	20	9.5	5	94.5
38.....	35.5	23	18	9.5	5	91.0
39.....	33.0	24	0	7.5	5	69.5
40.....	36.0	25	19	10.0	5	95.0
41.....	35.0	20	19	8.0	5	87.0
42.....	36.0	22	19	8.5	5	90.5
43.....	35.0	25	20	7.5	5	92.5
44.....	30.0	24	0	0	5	59.0
45.....	36.0	24	20	7.5	5	92.5
46.....	35.0	25	2	9.5	5	76.5
47.....	30.0	25	13	9.5	5	82.5
48.....	35.5	23	20	9.5	5	93.0
49.....	30.0	25	0	9.5	5	69.5
50.....	35.0	23	0	7.5	5	70.5

CREAM.

101.....	36.5	25	13	8.5	5	88.0
102.....	28.0	25	0	9.5	0	62.5
103.....	30.0	25	0	9.5	5	69.5
104.....	33.0	21	0	8.0	5	67.0
105.....	30.0	25	0	9.0	5	69.0
106.....	34.0	25	16	10.0	5	90.0
107.....	34.0	25	18	10.0	5	92.0
108.....	36.5	25	8	9.5	5	84.0
109.....	30.0	25	(a)	9.5	5	(a)
110.....	36.0	25	(a)	9.5	5	(a)
111.....	37.0	25	(a)	9.0	5	(a)

^a These entries arrived too late for competition.

COMMENTS ON THE SCORES.

With the exception of a few samples the flavor of the milk and cream was very good. A few samples suggested a flavor of the cow stable and unclean utensils and a few had a distinct silage flavor. The lowest score for flavor of milk was 25 points; the highest, 37; the lowest score for flavor of cream was 28 points, and the highest 37.

The percentage of fat in the milk averaged 3.8, the lowest being 3 and the highest 7. The percentage of fat in the cream samples varied from 18 to 36. The lowest percentage of solids not fat was 7.20 and the highest 9.12. With but few exceptions the milk and cream exhibited did not exceed the required standard for acidity, which was 0.2 per cent. The lowest percentage was 0.13 and the highest 0.33.

The number of bacteria per cubic centimeter found in the different milk samples varied from 1,400 to 3,500,000. Sixteen of the 50 samples of milk contained less than 10,000 bacteria to the cubic

centimeter, a number small enough to meet the requirements for certified milk. The lowest number of bacteria found in the cream was 37,000 per cubic centimeter and the highest 8,640,000.

Perhaps the greatest criticism of the exhibits of milk and cream as a whole was the deposit of sediment or dirt in the bottom of the bottles. Only 8 samples of milk and 2 samples of cream were clean.

Of the 58 samples of milk competing 31 scored 90 or above.

THE DAIRY FARM COMPETITION.

This feature proved to be of great interest and practical value. Twenty dairymen entered their farms to compete for the prizes and they were visited by the judges and scored on the basis of the score card herewith. While this part of the work required considerable time and some expense, it is believed that it resulted in much good along the line of improving the conditions affecting the city milk supply. Full details of this feature of the work are given in Table 3.

SCORE CARD FOR DAIRY FARMS.

The following is a copy of the score card used:^a

[Front of card.]

[United States Department of Agriculture, Bureau of Animal Industry, Dairy Division.]

SANITARY INSPECTION OF DAIRIES.

DAIRY SCORE CARD.

Owner or lessee of farm _____.
 Town _____. State _____.
 Total number of cows _____. Number milking _____.
 Quarts of milk produced daily _____. Product is sold at wholesale retail. Name
 and address of dealer to whom shipped _____.
 Permit No. _____. Date of inspection _____, 190—.
 Remarks _____.
 (Signed) _____, *Inspector*.

^a A later and more simple form of card, embodying certain additional educational features, has since been adopted by the Official Dairy Instructors' Association as well as by the Dairy Division, and is shown on pages 35 and 36 of this circular.

[Back of card.]

DETAILED SCORE.

Equipment.	Score.		Methods.	Score.	
	Perfect	Allowed.		Perfect.	Allowed.
COWS.			COWS.		
Condition.....	4	.....	Cleanliness.....	10	.....
Health (outward appearance)...	6	.....	STABLE.		
Comfort.....	4	.....	Cleanliness		
Bedding.....	2	.....	Floor.....	4	.....
Temperature of stable.....	1	.....	Walls.....	2	.....
Protected yard.....	1	.....	Ceiling.....	2	.....
Cubic feet of space per cow:		.....	Ledges.....	1	.....
Over 300, 2; over 400, 4; 500	6	.....	Mangers and partitions.....	1	.....
to 1,000, 8.....	4	.....	Windows.....	1	.....
Feed.....	4	.....	No other animals in		.....
Water.....	8	.....	stable.....	1	.....
Clean.....	6	.....	Stable air.....	4	.....
Fresh.....	2	.....	Removal of manure.....	4	.....
STABLE.			To field or proper pit... 4		.....
Location.....	6	.....	30 feet from stable..... 2		.....
Well drained.....	3	.....	Cleanliness of stable yard.....	2	.....
Free from contaminat-		.....	MILK ROOM.		
ing surroundings..... 3		.....	Cleanliness		
Construction.....	10	.....	Care and cleanliness of utensils	6	.....
Tight, sound floor..... 3		.....	Inverted in pure air..... 2	10	.....
Gutter.....	1	.....	Clean (superficially)... 4		.....
Stall, stanchion, tie... 1		.....	Sterilized.....	4	.....
Low-down manger..... 1		.....	MILKING.		
Smooth, tight walls... 1		.....	Cleanliness		
Smooth, tight ceiling... 2		.....	Clean, dry hands..... 4	14	.....
Box stall.....	1	.....	Udders washed and		.....
Light: 1 sq. ft. glass per cow, 2;		.....	dried.....	10	.....
2 sq. ft., 4; 3 sq. ft., 6; 4 sq.	10	.....	Cleaned with		.....
ft., 8; even distribution, 2....		.....	moist cloth.....	8	.....
Ventilation: sliding windows,		.....	Cleaned with		.....
2; hinged at bottom 4; King	8	.....	dry cloth.....	4	.....
system or muslin curtain. 8....		.....	CARE OF MILK.		
Stable yard (drainage).....	2	.....	Cooling		
MILK ROOM.			Removed from stable	20	.....
Location.....	6	.....	immediately after		.....
Convenience.....	2	.....	milking each cow		.....
Free from contaminat-		.....	and promptly cooled	10	.....
ing surroundings..... 4		.....	Cooled to 50° F. or be-		.....
Construction.....	4	.....	low.....	10	.....
Floor.....	1.5	.....	51° to 55° F.....	8	.....
Walls and ceilings..... 1		.....	56° to 60° F.....	6	.....
Light.....	.5	.....	Storing.....		.....
Ventilation.....	.5	.....	Below 50° F.....	8	.....
Screens.....	.5	.....	51° to 55° F.....	6	.....
Arrangement.....	2	.....	56° to 60° F.....	4	.....
Equipment.....	6	.....	Transportation.....	10	.....
Hot water or steam..... 2		.....	Iced in summer.....	10	.....
Cooler.....	2	.....	Jacket or wet blanket		.....
Narrow-top milk pail... 1		.....	in summer.....	8	.....
Other utensils.....	1	.....	Dry blanket.....	4	.....
Water supply for utensils.....	6	.....	Covered wagon.....	2	.....
Clean.....	6	.....	Total		
Convenient.....	2	.....		100	.....
Abundant.....	2	.....			.....
Milking suits.....	4	.....			.....
Total.....					.....
	100	.....			.....

Score of methods..... multiplied by 2=

Score of equipment..... multiplied by 1=

Total..... divided by 3= final score.

NOTE.—Deductions may be made for exceptionally bad conditions.

NOTE.—If the herd has not been tuberculin tested within a year, the limit for the score will be 80.

DETAILS OF THE SCORING.

Table 3 shows the details of the scoring on each entry in the contest:

TABLE 3.—Detailed scores of the twelve farms entered in the dairy-farm contest.

Farm number.	Equipment.							Methods.									
	Cows (health, comfort, etc.), perfect 20.	Feed and water, perfect 12.	Stable (location, construction), perfect 36.	Milk room, perfect 18.	Water supply, perfect 10.	Milking suits, perfect 4.	Total score, perfect 100.	Cows (cleanliness), perfect 10.	Stable (cleanliness), perfect 16.	Stable yard and removal of manure, perfect 6.	Milk room and utensils (cleanliness), perfect 16.	Milking, perfect 14.	Care of milk, perfect 20.	Storage and transportation, perfect 18.	Total score, perfect 100.	Final score (methods $\times 2$ + equipment, divided by 3), perfect 100.	
1.....	19.5	12.0	22.5	15.0	10	0	79.0	7	11.5	6.0	15	10	18	6	73.5	75.33	
2.....	18.0	11.0	24.5	14.5	8	3	79.0	9	12.0	5.0	12	12	16	6	72.0	74.33	
3.....	19.0	12.0	28.0	13.5	10	0	82.5	9	15.0	6.0	11	4	8	12	65.0	70.80	
4.....	17.5	10.5	26.0	17.0	10	0	81.0	7	9.0	5.0	10	8	18	8	62.0	70.33	
5.....	19.0	12.0	21.5	10.0	10	2	74.5	9	12.0	5.0	10	8	8	10	65.0	66.00	
6.....	19.0	12.0	26.0	14.5	10	0	81.5	9	11.0	0.0	11	8	8	12	59.0	66.50	
7.....	19.0	12.0	14.0	9.5	10	0	64.5	6	6.0	3.0	11	14	16	8	64.0	66.00	
8.....	19.0	12.0	24.0	9.5	10	0	74.5	9	14.0	1.0	10	4	8	6	52.5	59.50	
9.....	17.0	10.0	18.5	12.0	8	0	65.5	7	9.5	1.0	10	8	10	10	55.5	58.33	
10.....	13.0	9.5	22.0	8.5	8	0	61.0	8	12.0	5.5	10	10	6	6	57.5	58.66	
11.....	14.0	10.0	17.5	10.0	10	0	61.5	7	7.0	5.0	8	6	6	6	45.0	50.50	
12.....	19.0	12.0	18.0	8.0	10	0	67.0	9	3.0	2.0	8	4	8	6	40.0	49.00	
Average.....	17.8	11.2	21.8	11.8	9.5	0.4	72.5	8	10.2	3.7	10.5	8	10.8	8	59.2	63.6	
Average per cent perfect.....	88.8	93.8	60.8	65.7	95.0	10.0	72.5	80	63.8	61.6	65.6	57.1	54.0	44.5	59.2	63.6	

PRINCIPAL DEFECTS FOUND.

Among the principal defects found on the dairy farms were unclean stables and lack of light and proper ventilation. There were also some defects found in the construction, equipment, and cleanliness of the milk houses and the handling and cooling of the milk. The feed of the cows and the water supply were generally good. The average score for equipment—72.5 points—is commendable. The average score for methods—59.2 points—indicates a good many defects in cleanliness and in handling the product, and it should be improved. The average score for all conditions was 63.6, a rating considerably above the average of dairies throughout the country.

LIST OF PRIZE WINNERS.

MILK.

	Score.
First prize: A gold medal, awarded to L. M. Zediker.....	95½
Second prize: A silver medal, to Sidney Schiever.....	95½
Honorable mention: The following dairymen whose milk scored 94 points and over:	
F. G. Brown.....	95
F. D. Cresey.....	94½
D. A. McCalamont.....	94
W. K. Briggs.....	94
Louis A. Handt.....	94
J. C. Weaver.....	94

CREAM.

	Score.
First prize: A gold medal, awarded to J. F. Hudson.....	92
Second prize: A silver medal to L. Garbe.....	90

DAIRY-FARM CONTEST.

First prize: A gold medal awarded to Joseph Groves.....	75½
Second prize: A silver medal to F. G. Brown.....	73½
Third prize: A silver medal to George D. Paxton.....	70½
Honorable mention:	
Hartman Brothers.....	70½
Robert Bamford.....	66
J. W. Quivey.....	66½

ADDRESSES AND PAPERS.

The morning session was called to order by C. B. Lane, assistant chief of the Dairy Division.

After congratulating the dairymen of the Pittsburg district upon what he said was the largest dairy contest ever held in this country or any other, Mr. Lane spoke in part as follows:

OPENING REMARKS BY C. B. LANE.

We have come here to consider the most important food, the cheapest food, the food that nourishes four-fifths of the babies of this country, the food that has no substitute—pure milk. The problem of providing clean, healthful milk for the 90,000,000 people of this country is occupying the attention of the physician, the chemist, the bacteriologist, the veterinarian, and the sanitarian as never before.

It is only a few short years since the science of bacteriology has been applied to the milk supply of cities; since, in fact, we have given this subject of milk any really serious thought. The question of sanitation is one that is uppermost in the minds of the people to-day, and no science has made such rapid progress during recent years as this. The entire civilized world is throwing itself into the fight against unnecessary insanitary conditions, against unnecessary sickness, and against unnecessary and shameful loss of life resulting from insanitary conditions, from impure milk, and from all impure food supplies. It is said to-day that national intelligence may be known by national sanitation. General conditions being the same, the city having the best milk has by far the lowest death rate. One city in our own country reduced the death rate of children under 5 years of age, from all causes, from 33 per cent to 15 per cent, the diminution beginning immediately on the improvement of the milk supply. The city of Copenhagen, Denmark, reduced its death rate from one of the highest to the lowest by simply purifying the milk supply. We can hardly exaggerate the full importance of pure milk, and every citizen should feel a proper sense of responsibility in the matter and insist that all reasonable health laws be complied with.

The demand is made that the dairymen of this country improve their methods, adopt new standards, and meet new demands. Some of the sanitary theories may be overdrawn and some unfair demands may sometimes be made upon producers, but there is one thing certain—the dairymen of Pittsburg and of every other city will have to deal with this reform movement, and how this can best be done is one of the subjects that will be discussed here to-day. The demand is also made, and rightly, that the consumer do his part toward bringing about an improvement in the product which he has on his table daily.

If I were to pass judgment on the producer and consumer, I am inclined to think I should give the producer the credit for having advanced farthest in doing his part

in the fight for pure milk. The consumer needs to be educated to take proper care of milk when it reaches his door. Unfortunately, the law stops at the consumer's door, but it follows the producer all the way from the cow to the kitchen. If we should examine conditions to-day, we should find many a filthy ice box that is far worse than the worst examples of dairymen's milk houses. The consumer should examine the source of his supply and pay the dairyman a living price when the product is delivered to him in good condition, rather than be looking for the cheapest milk he can buy. The average consumer is surprisingly ignorant concerning his milk supply. He not only does not realize the importance of having pure milk, but he is ignorant concerning its greater cost. Three-fourths of the milk consumers of this country have never looked up the source of their milk supplies or seen any account of them.

It is interesting to note the strides that the milk producers are making in this world-wide effort to improve the quality of milk. Dairymen in all sections are becoming interested to raise the standard of their business, and National, State, county, and local meetings are being held everywhere to discuss these matters. The fact should not be overlooked that the vital question, financially, is not so much securing a better price as it is cheaper production. To illustrate: In one county in your neighboring State that was investigated it was found that more than half of the farmers were getting less than 3,500 pounds of milk a year from their cows, and more than half received less than a dollar for every dollar they spent in feed. We need to look at things more and more from a business standpoint. Is it to be wondered at that these men receive only beggarly returns from their cows when only one dairyman out of ten reads any paper devoted especially to his life work?

The milk supply of Pittsburg ought to be as nearly perfect as possible. The United States Department of Agriculture is very glad to have this opportunity of sending representatives to this city and of giving you any assistance possible. We want to get closely in touch with your work. We want you to ask questions, and we want to receive information as well as give it. The object of this meeting is educational, looking toward better dairy conditions, better milk, and better prices.

REMARKS BY PRESIDENT SMITH, OF THE CHAMBER OF COMMERCE.

Mr. Lee S. Smith, president of the chamber of commerce, gave the address of welcome and spoke in part as follows:

I want to welcome you on behalf of the chamber of commerce to these rooms. Chambers of commerce were organized some hundreds of years ago for a single purpose or object—to better the condition of the business of those who were connected with them—and for hundreds of years they followed that line almost exclusively. But for years past this chamber of commerce has been seeking to do things that would tend to elevate our citizenship and make our city better worth living in—to enlarge it and to make it a better Pittsburg in reality as well as numerically—and I think we have accomplished a great deal. When this milk contest was brought to our attention, the chamber of commerce took it up unanimously and said it was just one of the things we ought to take hold of. I am glad to say that in the weeks that have passed since we made that determination I have been congratulated by people on the interest we are taking in this great work.

RESPONSE BY JOHN W. QUIVEY FOR MILK PRODUCERS.

Mr. John W. Quivey, of Houston, Washington County, Pa., responding on behalf of the milk producers, said in part:

On behalf of the large number of people engaged in milk production and located in this busy Pittsburg district, I can say we appreciate the efforts of the chamber of

commerce in trying to arrange for more friendly relations between the producer and the consumer of the products of our dairy farms. We think when they see the number who were interested to such an extent as to compete for the prizes they have offered, they will realize far better than I can say to them that we are willing to meet the consumer on neutral ground and have a good time, show him samples of our products, and have these representatives from our experiment stations and the Agricultural Department at Washington tell them in what kind of places we keep our cows and tell us how to remedy some of our shortcomings.

Did you ever stop to think what an immense industry we represent? The last census shows over 16,000,000 milk cows in the United States, worth over \$500,000,000; the value of their products—milk, butter, and cheese—is above \$500,000,000; the total value is, therefore, more than \$1,000,000,000. The farm lands and equipments representing this industry are worth several times this amount. Estimating one man to care for ten cows, the dairy industry requires the services of nearly two millions of our population, in many cases requiring special training and superior skill such as command large salaries in other callings.

The tendency of all business interests the last few years has been toward combination, but of all interests dairying seems to be the least adapted to uniting all branches under one head. The future of our industry seems to be with the small farmer who has from 10 to 20 cows. To such as have a knowledge of the business and are so situated that they can sell direct to the consumer, I think this industry has a bright outlook. But we are not all so located and must depend on the middlemen for a market for our product.

The dairy farmer of the future must make his products so wholesome, the quality and condition so attractive, as to defy competition. The consumption of milk and cream is increasing at a rapid rate in our cities and towns. The demand is practically unlimited, depending only on the ability of the dairyman to furnish a pure, clean, and palatable article. Good quality should mean better prices, but in too many instances a great deal more attention has been given by boards of health to educating the farmer or dairyman as to the necessity for cleaner milk and the methods of producing it than has been given by them to educating the consumer as to the increased money value in such milk. It is right and proper that milk intended for human consumption should be as free as possible from contamination, but to accomplish this increases the cost, and who is going to pay the farmer for his additional outlay? It certainly costs more to produce a clean milk than the other kind, owing to the increased labor, and it is only right that the consumer should be willing to pay more for such milk. It is our privilege and duty to demand such legislation as will protect our just rights, but we, as dairymen, should make every effort that care, science, and skill can make to improve our dairy products and place them on the market in a wholesome and attractive form. Our products have often been carelessly made; fraud and deception have been practiced to such an extent that the consumer has lost confidence. Convince the people of our cities by honest merit in our goods that they are honestly and carefully handled from the cow to the consumer's table, and confidence will be restored and greater things are in store for the dairy industry than were dreamed of.

THE ESSENTIALS FOR THE PRODUCTION OF WHOLESOME MARKET MILK.

By Prof. H. E. VAN NORMAN, *State College, Pa.*

Out of the close contact which the medical profession necessarily has with the life of the human race came some years ago the realization that there is a tremendously high death rate among the city children fed on cow's milk. Investigation has led to the conviction that a large proportion of the deaths among milk-fed infants are due to faults in the milk which develop there after the milk is drawn from the cow.

Some of the trouble is due to bacteria which are the direct cause of disease, but some is also due to those forms which, although not in themselves causing disease, yet

in the course of their growth develop products that may be injurious to the delicate stomach of the weak or sickly infant. The latter class is much the more common. Such bacteria may come from the surface of the udder and flanks of the cow, the dust in the air of the barn at milking time, from the clothing and hands of the milkers, or from the improperly cleaned cans and other vessels. Manure, hay, straw, and other solid matter may be strained out of the milk, but fine wire, cloth, cotton, or filter paper will not strain out the minute bacteria which have been carried into the milk by this foreign material and which can cause so much trouble.

It is the knowledge of these facts which has led to the vigorous and, unfortunately, sometimes unreasonable campaigns started for the justifiable purpose of securing a more wholesome supply of milk for the city babies and invalids.

The milk producer has often failed to realize that because his strong, husky children, born of parents living a vigorous, active, more or less outdoor life, surrounded by plenty of fresh air, have thriven and grown on his milk used within twelve hours of the time it was drawn, it does not prove that it is free from dirt, dust, or bacteria. By the time it had been held from two to twenty hours, hauled or shipped to the city, stood possibly twelve or twenty-four hours in a milk depot, churned over city pavements in a wagon, then dipped from a can in a stuffy grocery into a poorly washed tin or pitcher to stand an hour or more in a warm room, there may have developed in it that which will make the sick baby worse, or even cause death.

Fortunately all milk is not subjected to this treatment after it leaves the farm, neither are all producers careless or neglectful. City health officials are learning that producers are not all bad men, that far the largest number offend from ignorance. The producer is also learning that there may be faults in his product he never dreamed of.

Having heard the extremists' statements on both sides of controversies where none should exist, and knowing something of the situation here in and about Pittsburgh, I may congratulate the producer and those charged with the authority and responsibility of protecting the interests of the consumer on the saneness and reasonableness of the attitude and methods used to secure for the people of Pittsburgh the best possible milk supply.

The producers are willing to learn, while the authorities realize that changes and improvements cost money. A campaign of education is necessary—education of the consumer to the difference existing in the quality and value of milk; education of the producer to the faults which he may overcome without prohibitory additional expense.

What is essential for the production of a wholesome market milk?

First, there should be thorough appreciation of the fundamental principle of cleanliness and cold.

Cleanliness means to keep dirt out of the milk. Most people would hesitate to set a table in a cow barn and work the cake dough there for five minutes, because of the dust and dirt that would get into it; yet they do not hesitate to handle milk, which is also a food product, not only in the air of the barn but right under the cow where any loose particles can fall in.

By cooling is meant getting the milk cold, not merely going through the motions. To place a can of milk in a vat or spring of water will not of necessity cool it, neither will running it over a cooler do so unless the water in each case is cold enough. What counts is getting the milk cooled to a temperature of 50° F., or, better, 45 degrees, at the earliest possible moment after it is drawn from the cow. The spring water or well water or the city water may be cold enough to do this; if so, well and good; if not, ice may be necessary. The point is, get the milk cold and know that it is cold.

The air of the stable at milking time should be free from dust. Handling hay or grain just before milking has been shown to put twice as many bacteria into the milk drawn immediately afterwards, while the handling of dry corn fodder put three times as many in. Brushing the cow doubled the number of bacteria. Not stripping the

cow thoroughly seemed to increase the number of bacteria in the next milking. Different milkers showed a big variation in the number of bacteria in the milk drawn by them, some men producing milk with only one-third as many bacteria under similar conditions. Boiled water in which the milker washed his hands before milking was shown to contain 45,000,000 bacteria per cubic centimeter. All of these and many more figures might be given to emphasize the importance of this part of the work.

Under ordinary farm conditions I would recommend the use of a small-top milk pail. An opening 6 inches in diameter exposes approximately one-fourth as much surface to collect dirt as does a pail with an opening or top of 12 inches. If the small opening is not quite vertical so that the milk enters the pail from the side, still less dirt will get in. Having taken these precautions to secure clean milk, it should be removed immediately from the barn and not poured from one vessel to another in air laden with odors from the manure and dust from the feed.

Aeration—that is, exposing to the air by running over a cooler—is a good thing if the air is pure; otherwise it is objectionable. If cooling is done by placing the cans in water they should be stirred once or twice during the first hour, as this will very materially increase the rapidity of cooling.

Another factor in this problem to which all concerned should give attention is the practice prevailing in places of not washing milk cans immediately on emptying. Milk is allowed to spoil in them, and when the cans get back to the farm they are in a condition which no vessel intended for milk should ever be allowed to get into. Somebody is responsible for this neglect; the responsibility should be fixed and the evil corrected.

In conclusion I may sum up by saying that the essentials for wholesome milk from the standpoint of the handler are healthy cows, in healthful surroundings, milked by clean men in air free from dust and odors, and immediate chilling of the milk; this makes clean cold milk.

LEGISLATION IN REFERENCE TO THE MILK SUPPLY OF THE CITY OF PITTSBURG.

By Dr. J. C. McNEIL, *Veterinarian and Dairy Inspector for Pittsburg.*

Our present milk laws are very full and adequate, and the bureau of health is well fortified to protect the consumers of milk against any impure, unwholesome, or adulterated milk. Not only do the acts of the assembly of 1901 and 1907 and the city ordinances, which embody all the features of these acts, give us sufficient power to refuse to allow the sale of impure, unwholesome, or adulterated milk, but we have little trouble in securing convictions in cases of violation of these laws. The provisions in force are as follows:

Section 1 provides that any person who offers for sale as pure milk any milk from which the cream or any part thereof has been removed or which has been adulterated or changed in any respect by the addition of water or other substances shall be liable to penalties.

Section 2 provides for the sale of "skimmed milk" and says that such milk must have on the outside of each can the words "skimmed milk" permanently soldered in metallic letters not less than 1 inch in height. In case of the delivery of skimmed milk in glass bottles the words "skimmed milk" shall be blown in the bottles in letters not less than 1 inch in height.

Section 3 provides that skimmed milk shall contain not less than 8 per cent of milk solids exclusive of butterfat.

Section 4 provides that any person who shall sell any impure, unwholesome, or adulterated milk, or shall keep cows for the production of milk in a crowded or unhealthy condition, or feed the same on food that produces impure, diseased, or unwholesome milk, or who shall feed cows on distillery waste commonly called swill, or upon any substance of an unwholesome nature, or who shall not allow his cows free

movement in the open air at pasture, weather permitting, at least four hours each day shall be liable to a penalty.

Section 5 defines rather specifically impure, adulterated, and unwholesome milk. This section of the act declares the addition of water, ice, or any other substance to be an adulteration. Milk that is obtained from animals fed on distillery waste, or upon any substance in a state of decomposition, or upon any substance of an unwholesome nature, or milk that has been exposed to or adulterated by the emanations, discharges, or exhalations from persons or animals having any contagious disease, by which the health or life of any person may be endangered, or milk from tuberculous cows, or cows suffering from any febrile disease, is declared to be unwholesome and impure.

Section 6 provides standards for the percentage of water, butterfat, and specific gravity. The minimum for butterfat is 3 per cent, the maximum for water not more than 88 per cent, and the specific gravity at 60° F. shall be between 1.029 and 1.033. All milk of a lower grade shall be deemed adulterated.

Section 7 relates to the healthfulness of the cows, with special reference to tuberculosis, their condition to be determined by physical examinations and the tuberculin test. This section also provides for an inspection of the premises occupied by the cows as regards their sanitary condition, and gives the superintendent of the bureau of health, his officers and experts, the right at all times to have full and free access to any place where such animals are kept, whether such places be within or beyond the limits of the city, and any person impeding such access shall be guilty of a violation of this act.

Section 8 provides for the licensing of all dealers selling milk in the city. The cost of a license is only \$1. The dealer must, however, have printed with his name on the outside of all wagons used in conveyance of milk his license number in letters not less than 4 inches in height.

Section 9 provides penalties for violation of any provision of the act. The penalty for the first offense shall not be less than \$10 nor more than \$25, with not more than \$50 for the second offense, and for each offense thereafter not less than \$50 nor more than \$100. In default of payment of any fine the person so offending may be committed to jail, workhouse, or other penal institution of the county for a period not exceeding 30 days.

I have referred only to the more important features of the laws concerning milk, from which it can readily be seen that our bureau of health has ample power to deal with both producers and dealers. An act of assembly approved April 15, 1907, regulates the sale of milk, skim milk, and cream, and provides that the liquid or wine measure with 231 cubic inches to the gallon shall be the standard of measurement, although nothing in this act will prevent the sale of skim milk, milk, or cream by weight.

Another act requiring the thorough cleansing of the inside of all vessels and cans used in the shipment of milk and cream on railroads was passed by the last legislature and became a law May 25, 1907. This was very desirable legislation and has been of great assistance to the bureau of health in its efforts to give the people of Pittsburgh a cleaner milk supply.

For many years the city of Pittsburgh has had a system of milk inspection, but this work was more or less mechanical. Formerly an inspector's principal duties were to collect samples from wagons and stores and bring these samples to the laboratory of the bureau of health, where they were examined for adulteration and the use of preservatives and were tested for butterfat. Such work was and still is very important and essential, but in later years the heads of health bureaus have recognized that to get clean, wholesome milk it is necessary to start with the producer. Five years ago dairy inspection was scarcely known in this country, and it was some of the larger dairy companies that first organized a system of inspection of the dairies that furnished them with milk. They realized the necessity for such inspection in order

to give their customers a high-grade milk. It can readily be seen that an effective system of inspection should commence at the farm and with the cow. It matters not how much care may be taken all along the line from the farmer to the consumer, if the cow is not healthy and the stable hygiene is neglected the consumer will surely get an unwholesome milk.

All large cities are now adopting a system of dairy inspection. New York City has a force of 35 dairy inspectors, but when one realizes that it requires the product of 32,000 dairy farms to furnish the city of New York with its milk supply, that number is not more than adequate. These inspectors are able to visit each dairy farm sending milk into the city twice a year. Within the past six months Pittsburg has established a system of dairy inspection. The work has been started with a force of two men, and good results are already being secured. It is estimated that the number of dairy farms shipping milk into Pittsburg is in the neighborhood of 7,000. It can readily be seen that the force is inadequate, but we hope that our city officials may see the necessity for more of this work and increase the force.

It may be interesting to outline the duties of a dairy inspector and to discuss some of the points which should be considered.

The cow.—Commencing with the cow, the first thing that attracts attention is her outward appearance, her condition of flesh, the condition of her hair, her breathing, the look in her eye. The lungs should be auscultated and the udder and teats very carefully examined. Inquiry should be made as to whether or not she has been tested with tuberculin, and if so, when. The comfort of the cow next calls for attention. The bedding, temperature of the stable, the barnyard, the number of cubic feet of air space per cow, and the character of the feed and water should be carefully looked into. Last and by no means the least important feature in connection with the cow is her cleanliness, as a cow can not furnish clean milk when her udder, flanks, and tail are caked with manure. I always recommend the clipping of long hairs from the cow's udder, flank, and tail. It costs the dairyman little or nothing, makes his work of cleaning the udder much easier, and is of great help in producing a cleaner milk.

The stable.—In approaching the cow stable the first thing that attracts the inspector's attention is its location relative to other buildings, its drainage, and the drainage and cleanliness of the stable yard. The disposal of the manure next receives attention. Is it hauled daily to the field, kept in a proper pit, or allowed to rot the boards on the sides of the barn? Entering the stable, the general construction is considered: Has it a sound, tight floor, a gutter, stanchions, low mangers, smooth, tight ceiling, and smooth, tight walls? What is the number of square feet of glass per cow and the method of ventilation? While you are noting the equipment, the cleanliness or dirtiness of the stable is always before you. Too often through the country we find loose ceilings. By that I mean saplings run through the stable with straw or hay piled on top to make the ceiling. Such places invariably have the ceilings and walls covered with dust and cobwebs, and some of this dust and dirt finds its way into the milk. Most dairymen agree with me that cobwebs are a bad thing in a dairy stable, although I had one man argue that they kept down flies and he would be very sorry to part with his cobwebs. The keeping of horses, pigs, or poultry in the cow stable is also very objectionable.

The milk room.—In examining the milk room we note and give credit for its proper location, construction, equipment, arrangement, water supply, milking suits, general condition of cleanliness, and the care and cleanliness of utensils.

Milking methods.—Too much care can not be taken in this most important work. It costs the producer no more to milk cleanly than to do it otherwise if he once forms the habit. In scoring for milking 14 points are allowed as follows: Clean, dry hands, 4; udders washed and dried, 10; making a perfect score. If cleaned with a moist cloth

8 points are given, and if cleaned with a dry cloth only 4 points are allowed. Wet milking is severely condemned.

Care of milk.—Under this head we give credit for proper cooling, storing, and method of transportation.

It is difficult to get trained men who can properly serve as inspectors, since the personal attitude of the inspector is of so much importance. It is manifestly desirable that none except those who thoroughly understand dairies should be employed. Trained men are hard to find, but it is not hard to find persons who will serve as inspectors for the sake of obtaining the salary.

The relation of the inspector to the farmer should be of a most friendly nature, and it should be the purpose of each to help the other. Any respectable farmer would prefer to furnish good rather than poor milk; still it is almost impossible to furnish good milk if the dairyman has no equipment. If he has no floor in his stable, no windows, and no ventilation he can hardly be expected to furnish clean milk. If the inspector can show him the advantages and cheapness of a concrete floor and gutter he probably will put in one in the near future. The inspector can show him the advantages of light and ventilation, and, while the farmer may not be able to put in the King system of ventilation, there is no one too poor to afford a few muslin windows. The dairyman, when you commence talking muslin windows to him, fears that his cows will be too cold, etc.; but if you have made a favorable impression on him, he will be disposed to give them a trial.

Practically all dairies in Greater Pittsburg with its surrounding boroughs and townships have been scored. These score cards are on file at the bureau of health, and they will be gladly shown to any person who is interested in knowing what sort of a place his dairyman keeps.

DAIRY CONTESTS.

By C. B. LANE, *U. S. Department of Agriculture.*

Friendly competition is a great stimulus whether on the athletic field, on the race track, or in the production and manufacture of dairy products. The competition here to-day is in milk and cream, and those who have entered will learn many lessons by seeing their product alongside that of others. If your product scores high you know that you are practicing right methods; on the other hand, if it scores low the faults are clearly pointed out and you learn how to improve. I have watched these contests over the country with much interest from the first, and I assure you that they have already had a great influence in the production of cleaner and better milk. A brief description of some of the various contests may be of interest.

The movement was started at the National Dairy Show in 1906. This was a national contest open to all producers of milk and was held under the supervision of the United States Dairy Division. The object was entirely educational; we desired to show some of the possibilities in the handling and keeping qualities of milk and cream. The handling of dairy products is usually of greater importance to the health of the people consuming them than is the production. The most indifferent dairy farmer can produce milk and cream, but it requires knowledge and skill to handle them properly. For example, one man in the Chicago contest had 21,000,000 bacteria per cubic centimeter in his milk and his product soured very shortly after reaching Chicago; another shipped his milk 500 miles and no bacteria could be found in it, and this milk kept five weeks before souring. These contests, then, show the dairyman's skill in handling milk. In the first contest the defects were largely off flavor, dirt, and high bacteria. There were 45 samples exhibited, 23 being market milk. The average score for market milk was 89.7 and for cream 93.6. Exhibits were invited from all parts of the country, and dairymen in thirteen different States responded. Some of these samples were shipped over 1,000 miles, yet were found in excellent condition when three days old.

The highest scored up to 98. Some of the milk, as before stated, kept for five weeks, and some of the cream for seven weeks, with no other preservative than cleanliness and cold. Medals were awarded for the best milk and cream, as in the present contest.

The second contest, and I might say the first State contest, was held in New Hampshire, December 6, 1906, in connection with the State Dairy Association. Here 11 samples of milk and 9 samples of cream were exhibited; the average score of the milk was 90.8 and of the cream 91.4. The same defects were found in the milk entered in this contest as in Chicago, namely, some off flavors of silage and dirt, and high bacteria. These defects were carefully pointed out, and the man who had the dirtiest milk last year took the hint and also took a prize in a similar contest this year.

Other contests have been held in Illinois, Pennsylvania, Ohio, Connecticut, Massachusetts, and New York. Cleveland was the first city to hold a contest of this character (1907), and a lively interest was shown. The results were so beneficial to all interested that a second contest was held the present year.

Lessons from milk contests.

Value to the producer.—These contests are helpful to the producer in pointing out to him very clearly the exact conditions of his product and showing him where he can improve. They present an object lesson which is not easily forgotten. They are of value from an educational standpoint; the dairyman comes to understand the importance and significance of improved methods of handling milk, and a contest may be the means of starting him on the road to success. This was certainly true in Cleveland, where, on the inauguration of the inspection work of the board of health, considerable opposition developed among the dairy farmers; but, with a thorough understanding of the object of the inspection which was set forth at the dairy meeting held in connection with the milk contest, this opposition has ceased and inspection is sought and welcomed. The most cordial relations now exist between the dairymen and the inspection department. I am told that the milk contest and the dairy-farm contest held in connection with it definitely contributed to this better spirit.

There is much encouragement for cleaner milk in the future; dairymen are now taking the initiative themselves and are observing the sanitary regulations prescribed by the boards of health. The trouble has been that boards of health have not always met the dairyman halfway in the past; they have gone after him with a club, when they should have first offered suggestions, assistance, and encouragement. Many dairymen do not understand why it is that methods which have been accepted for the past twenty-five years are suddenly condemned. They want an explanation and they are entitled to it. But I believe that when the dairyman understands the importance of greater cleanliness he will be ready to make improvements. Up to the present time there has been but little incentive to the production of high-class milk, with the possible exception of certified milk. Clean and dirty milk have sold for the same price in direct competition with each other. I believe there is going to be a decided change, however, in the near future; the dairyman who produces clean milk will receive a premium for his product, and careful inspection of the dairy farms and the milk produced will bring this about. Already an advanced price is being offered by milk dealers in a number of cities for milk from high-scoring dairies. A score such as those given in this contest, stating certain conditions found in the dairies to be satisfactory, will have a tendency to increase sales and inspire confidence among the consumers.

Value to the dealer.—Milk contests are of value to the dealer in assisting him to determine where the good dairies are, making it easier for him to find a supply of milk to meet the demand made upon him for a good product. With a supply of good milk to handle, there is less trouble with sour milk and less complaint from customers.

Value to the consumer.—The principal value of these contests to the consumer is in pointing out the defects in milk and showing him what good milk really is. With

the average consumer, however, milk is looked upon as a necessity to be bought as cheaply as possible. If he is asked to pay a higher price, he immediately thinks he is being robbed. He gives little thought to the fact that the price of grain has been increasing during the past ten years and that wages for farm labor are not only higher but the labor is more difficult to obtain. The consumer should know that it costs more to produce clean milk and that it means extra labor and extra care, and the dairyman can not be expected to produce it without reasonable profit.

Application of the plan to other cities.

The results obtained in the contests described in the preceding pages indicate that a similar meeting and exhibit would be of value in improving the milk supply of any city. It is simply a means of reaching the producer, the dealer, and the consumer, and educating them on the subject of clean milk. That the plan has worked successfully in Cleveland and Pittsburg there is no question, and it is believed that there are scores of other cities where similar results might be obtained. Such a contest should have the direct support of the board of health or some organization directly interested in improving the milk supply.

(Good and bad dairy conditions were pointed out by the speaker through the use of photographs and charts.)

TUBERCULOSIS IN CATTLE.

By DR. LEONARD PEARSON, *University of Pennsylvania.*

Tuberculosis is not only a most important disease of mankind, but is also very prevalent among domestic animals, particularly among dairy cattle. The question as to the relation of tuberculosis of animals to tuberculosis in man is one that has recently received a vast amount of study and searching analysis. To summarize the present opinion of the most careful students in this field, I might say that there is no question as to the possibility of the transmission of tuberculosis of cattle to mankind. There are, however, differences of opinion as to the amount or extent of such transmission. It is recognized and has been proven by scientists in practically all civilized countries that tuberculosis of children is not infrequently caused by tubercle bacilli of the type that is characteristic of tuberculosis in cattle. The surgical forms of tuberculosis in children and tuberculosis of the glands of the neck and throat and tuberculous diseases of the organs of the abdomen are most frequently caused by bovine tubercle bacilli. The common "consumption" of the lungs is very rarely, if ever, caused by bovine tubercle bacilli. The most important source of tuberculous infection for man is, of course, people affected with consumption. But even though only 1 per cent of the cases of tuberculosis that arise from year to year are caused by bovine tubercle bacilli, the total number of cases so caused would be very large. In New York City 20,000 new cases of tuberculosis are reported each year. One per cent of milk infection would mean 200 cases each year. Ten per cent would mean 2,000 per year. Probably the real percentage is between these limits. Tubercle bacilli from cattle enter the milk not only from the udder, but also from the dirt of the stable as it falls into the milk pail from the surface of the cow.

A cow with tuberculosis of the lungs but with a perfectly sound udder does not furnish infectious milk as it is drawn. But the milk is very likely to become infected during the act of drawing or before the milk leaves the stable. Hence the importance of removing from dairy herds not only such cows as have diseases of the udder, but also all cows with advanced or open tuberculosis.

The compulsory tuberculin test of the dairy herds should not be attempted until adequate provision for carrying it out is made by the State. The expense of getting rid of tuberculosis among cattle is of importance to the public at large, and should be shared by the public. To permit it to fall too heavily on the dairymen would ruin

a considerable percentage of milk producers and would greatly increase the cost of milk to consumers. Farmers are suffering from tuberculosis among their cattle to a very large extent through no fault of their own. The knowledge through which protection might come has not until recently been available. The dairy herds have gotten into their present condition gradually, and in most cases without the knowledge of their owners. The State live-stock sanitary board should have an appropriation sufficient to enable it to take up this subject of freeing dairy herds from tuberculosis in a very much more vigorous way than is now possible. The work should begin by the inspection, without tuberculin, of milk-producing herds. All cattle with tuberculosis of the udder or with other visible forms of tuberculosis should be removed from these herds. Where there is reason to believe that a herd is heavily infected, it should be tested with tuberculin, and the tuberculin test should be used where it is the desire of the farmer to clean his herd entirely from tuberculosis and keep it so. The State should cooperate and assist all farmers who have this desire.

The health department of the city of Pittsburg is to be congratulated upon the inauguration of a system of dairy inspection that is better in plan and character than can be found in any other place in Pennsylvania. The improvement that will no doubt come from the systematic work that is being done by Doctor Edwards and Doctor McNeil will be of great benefit to the milk consumers of this city.

THE SCORING OF MILK AND CREAM.

By IVAN C. WELD, *U. S. Department of Agriculture.*

The judging or scoring of milk or cream is a study of those products not only from a chemical and bacteriological standpoint, but also from the standpoints of flavor and freedom from foreign matter. Certain definite mathematical values are given flavor, composition, bacteria, acidity, and appearance of package and contents. The sample of milk is examined for each of the foregoing conditions and rated according to its merits; and such ratings, when added, constitute the score of the milk sample under consideration, 100 points constituting a perfect score.

Flavor.—In the scheme of scoring, the weight given to this factor is 40 out of 100 points.

The palatability of any food is said to have much to do with its usefulness in nourishing the body. This may be due in part to the increased flow of saliva, which is stimulated by a particularly palatable food. The flavor and odor of milk, it may be said, are those peculiar properties which, acting on the organs of taste and smell, create in the mind of individuals a degree of satisfaction or disgust, as the case may be. In a way, it may be said that the cleaner milk has the better flavor. This brings us to a consideration of the conditions commonly affecting the flavor of milk and cream, namely: (1) Changes in flavor due to the physical condition of one or more cows in the herd; (2) changes in flavor due to one or more cows in the herd eating strongly flavored food; (3) changes in flavor due to the absorption of various odors in the atmosphere where milking is done or milk is stored; (4) changes in flavor due to bacterial infection and the development of bacteria in the milk.

While there is sometimes a combination of defective flavors, any one of which it is impossible to recognize, an experienced person will yet be able to judge the general quality of flavors and odors. In many cases distinct flavors and odors, if present, can be definitely recognized by specially trained men.

Composition.—(Weight, 25 out of 100 points.) About 47 quarts of cow's milk will weigh 100 pounds. Of this about 87 pounds is water, 4.95 pounds sugar, 4 pounds fat, 2.6 pounds casein, 0.7 pound albumin, and 0.75 pound ash. These are average figures, and if the composition of a cow's milk was never subject to variations from natural causes one of the somewhat troublesome questions of the past, present, and future milk supply would have been entirely eliminated. But the natural composi-

tion of milk is variable. The percentage of milk solids and water varies not only among different species of mammalia but also among different breeds of cattle and among different cows of the same breed. Some wide variations in composition may also be found in the milk produced by the same cow at different periods.

In view of the constantly changing percentages of milk solids, and also in view of the fact that milk is readily adulterated without materially changing its appearance, and furthermore in view of the fact that consumers can not judge for themselves regarding its quality, it long ago became necessary for the several States and cities to establish certain arbitrary standards for fats and solids in milk, and below which it should not be sold. These standards vary in different States; for instance, in some States a standard of 11.5 per cent total solids is the minimum, while in others 13 per cent is required. In some States a double standard is maintained which allows a lower percentage of milk solids in summer than during the winter months.

While in a few isolated cases the standards seem to be rather high, and therefore subject to well-deserved criticism, in other places they are so low as to admit of skillful adulteration of normal milk, which even then can meet every requirement of the local low standard. From the abundant evidence available I believe the consumer of milk can reasonably demand a milk that will contain not less than 3.25 per cent fat, or 8.5 per cent solids not fat, and a milk in which these combined shall equal at least 12 per cent.

To be sure, individual cows have been bred to produce an enormous flow of milk that will not normally contain so much as 12 per cent solids. These same selected cows may also be so bred that their progeny will in turn give even a greater amount of still thinner milk. It thus becomes possible by following a certain line of breeding to accomplish in that way precisely what has sometimes been accomplished by using the pump. Either practice, however, leads to the same result, and an arbitrary standard for fats and for solids not fat in market milk has long been, and doubtless will continue to be, the surest safeguard not only to the consumer of milk but for the honest producer and distributor as well.

The percentage of fat in milk and cream is determined by the well-known Babcock method. Knowing the percentage of fat, the solids not fat may be most conveniently estimated by (1) determining the specific gravity of the milk, or (2) the use of a short rule, namely, add two-tenths of the per cent of fat to one-fourth of the lactometer reading.

Bacteria.—(Weight, 20 out of 100 points.) While certain forms of bacteria may be useful in the manufacture of butter and cheese, we may safely conclude that so far as market milk and cream are concerned the fewer germs of any kind contained in these products the better for all concerned.

While milk in the udder of a healthy cow may contain bacteria, practically all contamination takes place after the milk leaves the cow's udder. The extent of the contamination depends almost entirely upon the conditions under which the milk is drawn and handled. Clean milk can only be secured by clean milkers who use clean utensils and who do their work under clean cows and in a clean atmosphere. There are various ways by which cleanliness may be secured. The expense of cleanliness need not be great, but the absence of it may be and sometimes is most damaging to a dairyman as well as to a community.

Basing my opinion upon the work of many clean and successful dairymen, I believe that certified milk in order to be scored perfect should not contain over 1,000 bacteria per cubic centimeter, and that a perfect market milk should not contain over 10,000 bacteria per cubic centimeter. Milk and cream containing bacteria in excess of the above-mentioned standards are scored according to the conditions found (see score card for milk), but no certified milk containing over 40,000 bacteria, and no market milk containing over 500,000 bacteria per cubic centimeter should be entitled to a single point on the score card.

The number of bacteria in milk or cream may be determined in the following manner: The bottle of milk is vigorously shaken so a fair sample can be secured. A 1 c. c. pipette (sterilized) is filled and the sample is transferred to a flask containing 99 c. c. of sterilized water, thus diluting the milk 100 times. A definite amount of milk thus diluted is then transferred to a sterilized Petri dish. To the diluted milk is added a culture medium (2 per cent lactose agar) melted or in a liquid condition. The diluted milk and culture medium are well mixed. The culture medium solidifies as its temperature lowers, and each individual germ is made stationary in the solidified jelly. The dishes and contents (milk and culture medium) are then placed in an incubating oven at about 95° to 98° F., where for two days the germs are allowed to grow. At the end of that time each original germ will have multiplied a sufficient number of times to form a colony large enough to be seen with the naked eye. By the aid of specially devised apparatus the colonies are counted. The necessary calculations are made, according to the dilution of the milk sample, and the total number of germs originally in the milk is known.

Acidity.—(Weight, 5 out of 100 points.) It seems to be a well-established fact among authorities that acids other than lactic acid are present in newly drawn milk. Any increase in the total amount of acid over that originally present in milk is due to the formation of lactic acid. According to the best authorities the formation of lactic acid in milk is the result of the presence and activity of bacteria. It has been demonstrated that when the total acid amounts to as much as 0.2 per cent the lactic-acid producing bacteria have usually become thoroughly established in the milk, and under fairly favorable conditions will soon render the milk sour and unmarketable. We can, therefore, understand the desirability of knowing definitely the amount or degree of acidity in the samples submitted in competition. The acidity of milk or cream is usually determined by titration. A given quantity of milk or cream—say 50 c. c.—is treated with a few drops of phenolphthalein, a chemical which in an acid solution is colorless like water but which in an alkaline solution is red. To the 50 c. c. of milk containing this chemical is added a sufficient amount of one-tenth normal alkali to neutralize the acid, when the milk or cream will be changed to a light pink color. The amount of alkali required to do this is carefully noted. As one cubic centimeter of one-tenth normal alkali will neutralize 0.009 gram of acid, the percentage of acid is determined by multiplying the number of cubic centimeters of alkali required by 0.009, dividing the result by 50 (or the number of cubic centimeters of milk or cream used), and then multiplying the product by 100.

Appearance of package and contents.—(Weight, 10 out of 100 points.) Since the practice of dipping milk from open cans on the street is highly objectionable, and the drawing of milk through a faucet from cans in the delivery wagon is an equally bad practice, it is found desirable to make use of some small package well adapted to delivering milk to the retail trade. During the past few years several new packages have appeared on the market and attracted more or less attention. Some have been constructed entirely of paper and some of paper and tin. In many cases packages of this class are very useful for grocery and market men who retail molasses, vinegar, kerosene, oysters, etc. In a limited way they are also well adapted for distributing hot coffee or milk to city laborers who are dependent on lunch rooms and restaurants for food supplies. In a small way such packages are also useful in retailing milk over the counter of the city milk plant, but experience has taught dairymen who have tried to use such packages in their regular retail wagon business that they are usually unsatisfactory in several important respects. As yet we have found no package that for attractiveness and general desirability can compare with the glass bottle. A retail package for milk should be free from metal or rubber parts. It should be so constructed as to enable rapid and thorough cleaning. The sterilizing of bottles used in the retail trade is particularly desirable and is not difficult to accomplish. Clean new milk should not be put in bottles that are in any way unattractive or unclean. We

must at first please the consumer's eye by showing him a clean, attractive package, entirely free from sediment or foreign matter. The milk must be well protected by a tight-fitting bottle cap. If a little boiling hot paraffin is poured on the top of the cap after it is in place it enters into every little crack and opening and effectually seals the bottle, making it practically air-tight. The paraffin also protects the cap, and the milk as well, from the hands of the dairyman, and from the dust, rain, or mud. Another thing that helps to protect the cap and also the milk is a parchment-paper covering for the top of the bottle. A paper covering is less expensive than metal and answers practically every purpose. Such a covering may be used either with or without the paraffin above mentioned. It affords additional protection to the milk and is especially desirable when bottles of milk are to be packed in crushed ice for shipment or for delivery.

It will be observed that a milk and cream contest systematizes and makes possible a study, in detail, of the various influences affecting the milk and cream supply. Such an exhibition brings to both producers and consumers of milk knowledge of an extremely practical value. It also promotes a desire on the part of the producer to supply only milk and cream of superior quality. Finally, it helps to teach the consumer that some milk is vastly superior, as a food, to other milk, and that a corresponding difference in price is after all but entirely natural and reasonable.

PROFITS OF A DAIRY FARM.

By Prof. OSCAR ERF, *Ohio State University, Columbus.*

Dairying in American agriculture is fast becoming a necessity because of its usefulness in sustaining and restoring the fertility of the soil. Many facts on record prove that soils devoted to dairying may be as fertile after centuries of farming as they were in the original state. In the densely populated countries of Europe dairying is the chief branch of agriculture because it has been found by actual experience that this branch of farming will furnish the greatest amount of nutrients to supply humanity for the least amount of loss. Lands that were abandoned in European countries centuries ago have been made fertile again by dairy farming. We have illustrations in America, even at the present time, where farms in the Atlantic States which had been abandoned because of unproductiveness, have been taken up again recently, and with good dairy farming made as productive as they were in their original state.

In grain farming the fertility of the soil is removed by selling the grain. We find that approximately \$8.35 worth of fertility is removed from the soil with the sale of every ton of wheat, while with every ton of corn that is sold approximately \$6.50 worth of fertility is lost to the soil; but in the case of dairying, where butter is made, and where all the by-products are fed to the pigs and calves, we find that only 36 cents' worth of fertility is removed for each ton of butter produced. The commercial value of a ton of wheat at 75 cents a bushel is approximately \$24.75. The commercial value of a ton of butter at 25 cents a pound is \$500. For each \$100 worth of wheat that is sold from the soil \$34.50 worth of fertility is removed from the farm, but for every \$100 worth of butter that is sold only 7 cents' worth of fertility is removed from the soil.

This vast difference between wheat farming and dairy farming is explained in this way: Suppose a cow is fed a ration of alfalfa hay and corn, both of which have been raised on the farm. The cow assimilates approximately 10 per cent of the fertilizing elements, the remaining 90 per cent going back to the farm in the shape of manure. Of the 10 per cent of fertilizing elements that are removed by the cow, about three-fourths go to make milk and one-fourth goes to the maintenance of the body. In the case where butter is made on the farm and milk is separated, its analysis shows that 90 per cent of the fertilizing elements of the whole milk is found in the skim milk; hence, cream and butter remove about 10 per cent of the whole amount. The skim milk is returned to the farmer and fed to the pigs and calves. These utilize part of

the material for building up the body and the unassimilated part passes on to fertilize the soil.

It behooves the American dairyman to practice a line of farming which is intensive and by which he can keep up the fertility of the soil.

The ordinary market milk, such as we find on the average farm, and which comes from herds that are not inspected nor tested for tuberculosis, is the milk that should be delivered to the consumer for the smallest possible price so as not to discourage consumption, but at the same time there should be a profit for the producer and for the distributor.

The public has criticised the dairyman for raising the price of milk, and various assertions have been made through the press that milk producers have formed a combine which is responsible for the advanced price. This, however, is entirely unfounded, and when an examination is made of the real situation the consuming public will find that, owing to the enormous rise in the price of feed and the expense of building in order to provide more sanitary conditions, together with the extra demands that the board of health has put upon the dairyman, dairy farming has become much less profitable, so much so that many of the farmers have gone out of business, while those who have remained have been obliged to raise the price of their products. With this in view it is my intention to itemize the cost of keeping a cow for a year, the following being a conservative estimate of the cost of feed required for this period:

Cost of one day's ration—

8 pounds bran, at \$26 per ton.....	\$0. 104
1 pound cotton-seed meal, at \$29 per ton.....	. 0145
4 pounds corn, at \$1 per cwt.....	. 04
30 pounds silage, at \$2.25 per ton.....	. 0337
5 pounds corn stover, at \$3 per ton.....	. 0075
5 pounds clover hay, at \$10 per ton.....	. 025
Total.....	. 225
The above rations for 215 days.....	48. 48
Pasture for 5 months, at \$1.75.....	8. 75
One pound of cotton-seed meal daily for 5 months.....	2. 17
Total cost for the year.....	59. 40

Many cows, however, take more feed than is prescribed in this ration, and can well digest more. As an illustration, Rosa Bonheur Fifth, of considerable fame in the Holstein breed, gave the enormous yield of 2,989 pounds of milk in thirty days, but her maximum daily ration at the height of the period was 114 pounds of ensilage, 12 pounds of corn meal, 9 pounds of oats, 3 pounds of bran, 9 pounds of oil meal, and 27 pounds of roots. Hence it may be seen that the ration prescribed above is economical in every sense of the word.

The total items of cost, including feed, in keeping a cow are estimated as follows:

Feed cost.....	\$59. 40
Labor for one man.....	24. 00
Interest, at 6 per cent on cost of cow (\$50).....	3. 00
Allowance for deterioration by age.....	2. 50
Allowance for death by disease or accident.....	1. 50
Allowance for failure to breed.....	. 25
Allowance for interest on cow barn.....	3. 00
Bull service.....	2. 00
General maintenance expense.....	2. 50
Hauling.....	2. 16
Straw for bedding cow.....	2. 00
Total expense.....	102. 31

We are often asked the question, How is it that dairymen have not discovered the enormous loss compared with the former cost of keep, and have still kept on producing milk and other dairy products? This can usually be explained from the table below, which shows the average cost of keeping a cow ten years ago:

Feed cost.....	\$22. 50
Labor for one man.....	9. 50
Interest on cost of cow (\$30).....	1. 80
Allowance for deterioration by age.....	1. 70
Allowance for death by disease or accident.....	1. 20
Allowance for failure to breed.....	. 25
Allowance for interest on cow barn.....	1. 50
Bull service.....	2. 00
General maintenance expense.....	1. 50
Hauling.....	1. 20
Total expense.....	43. 15

From this table it will be seen that the cost of keeping a cow has more than doubled in ten years.

The following table shows the cost per gallon of producing milk from cows of various capacities at the present-day maintenance price of \$102 a year, after making an allowance for value of manure and calf:

If cow gives 3,000 pounds of milk yearly, milk will cost per gallon.....	\$0. 292
If cow gives 4,000 pounds of milk yearly, milk will cost per gallon.....	. 22
If cow gives 5,000 pounds of milk yearly, milk will cost per gallon.....	. 176
If cow gives 6,000 pounds of milk yearly, milk will cost per gallon.....	. 146
If cow gives 7,000 pounds of milk yearly, milk will cost per gallon.....	. 125

Ten years ago these cows produced the same amount of milk at a cost of \$43 a year, which would make the cost per gallon as follows:

If cow gave 3,000 pounds of milk yearly, milk would cost per gallon.....	\$0. 124
If cow gave 4,000 pounds of milk yearly, milk would cost per gallon.....	. 093
If cow gave 5,000 pounds of milk yearly, milk would cost per gallon.....	. 074
If cow gave 6,000 pounds of milk yearly, milk would cost per gallon.....	. 062
If cow gave 7,000 pounds of milk yearly, milk would cost per gallon.....	. 053

In the production of butterfat the problem corresponds with that of milk production; hence with a maintenance cost at \$102 a year at the present time and \$43 ten years ago the results would be as follows:

Cost of producing butterfat now and ten years ago, with cows yielding from 200 to 450 pounds per annum.

	Cost per pound.	
	At present.	Ten years ago.
	Cents.	Cents.
With cow producing annually 200 pounds of butterfat.....	51. 0	21. 5
With cow producing annually 250 pounds of butterfat.....	40. 9	17. 3
With cow producing annually 300 pounds of butterfat.....	34. 0	14. 4
With cow producing annually 350 pounds of butterfat.....	29. 2	12. 4
With cow producing annually 400 pounds of butterfat.....	25. 6	10. 4
With cow producing annually 450 pounds of butterfat.....	22. 8	9. 6

It behooves the dairyman, therefore, to keep fewer cows and to pay more attention to the kind of cows he is keeping, as it is clear from the above tables that a cow producing a small quantity of milk does not pay for her keep, while one producing from 6,000 to 7,000 pounds or more is profitable.

Much may be said with reference to the recent action of some of the boards of health. While we realize that inspectors have not always been competent, nevertheless we are convinced that there has been an improvement in general milk supply within recent years. The fact must be taken into consideration by the consumer that milk is going to cost him more money than it has in the past. There is no need to argue against this proposition. The attitude of the general consuming public toward the milk question is evidenced by the newspaper and magazine articles that are constantly appearing and by the increased demand for and use of high-priced certified milk.

The regulations which are being put into effect by the boards of health of our cities are evidence that clean milk is demanded. On the other hand, the increased cost of labor and feed and the increased cost of equipment are evidences that the producer must receive more for his product. The law of supply and demand, other things being equal, will take care of the item relating to price which the consumer pays. It therefore becomes necessary to see that the increase in price is brought about effectively as soon as the demands are brought upon the dairyman.

The greatest need that is confronting the public to-day with reference to the milk question is education both on the part of the consumer and of the producer. Men who are more conversant with the dairy business as a business should be appointed on our boards of health. A better corps of inspectors is necessary, men who are not politicians but who are strictly practical, thoroughly familiar with the dairy business, and who are capable of giving instructions instead of being prosecutors. Last and most essential of all, the State needs to provide liberally for a corps of extension workers in dairying to help the farmers when in need.

THE RELATION OF THE HEALTH BUREAU TO THE DAIRYMAN.

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The essential function of the health officer is to safeguard the health of the community which he serves. In the problem of milk supply his duty is to secure for the people the best possible. To accomplish this he must necessarily use all practical measures at his command to get the producer to supply good milk. It is not enough, however, to set up arbitrarily a standard to which milk must conform and expect the producer to do the rest. The enforcement of any law is made easier when people are made to understand the purpose for which that law was made. The milk producer, whether he be farmer or dairyman, will more readily comply with the rules and regulations of the health authorities and meet the requirements of the inspector if he understands what purpose is served by such regulations or requirements.

The farmer who has never heard of bacteria or who does not know that disease may be caused by dirty milk will not carry out the suggestions of the inspector as intelligently as one who knows that the inspector has a very definite purpose in making such recommendations. An incident which occurred during my inspection of a dairy many miles distant from the city may make this point clearer: After the inspection of the dairy, which was a very dirty one, had been completed, the dairyman said his family had used milk all their lives produced in the way he was producing it and none of them had ever been sick. To emphasize his statement he pointed to his year-old baby, certainly the very picture of good health, who had been brought up on the bottle, and asked why his milk was not good enough for Pittsburg babies. When it was explained to him that his baby got the milk fresh and but a few hours old, before the germs which had found their way into the milk along with the dirt of his stable and because of his faulty methods had time to develop in excessive numbers, and that the milk which he shipped to Pittsburg was not fed to Pittsburg babies before it was one to three days older, and that every germ had multiplied a hundred or

perhaps a thousand fold, he saw the question in a new light and recognized that the inspector had a practical purpose in every requirement made.

The first step to be taken toward a proper relationship between the health authorities and the producer is the recognition of the fact that the health officer has a very definite purpose for every rule and regulation laid down for the producer to follow; that this purpose is the protection of the lives and health of the babies under his care as a guardian of the public health.

In Pittsburg last year more than 5,000 babies under 1 year old depended for their subsistence on the milk from your farms. Their health, their very lives, depended largely on the care with which this milk was handled on the farm, during transportation to the city, in the hands of the city distributor, and, lastly, by the consumer himself.

In this city last year 612 babies under 1 year of age died of diarrheal diseases. These deaths were very largely due to bad milk. Pittsburg's water supply, bad as it was last year, caused fewer deaths than its milk supply; scarlet fever, diphtheria, and all other children's diseases combined were not responsible for as many deaths as was its milk supply. These facts differ only in degree from those applying to many other cities. They show why cities are working for an improved milk supply. They show why Pittsburg is vitally interested in securing your cooperation in improving her supply. Your cooperation is necessary, for success depends upon cooperation, and cooperation always rests upon a proper understanding of the end to be gained and the ways and means employed to attain that end.

Milk is the most nearly perfect of all foods, as it contains in an easily digestible form all the nutritive elements required by the body. It is, however, an unstable compound. Nature intended it to be supplied directly by the mother to her offspring. Under such conditions it is perfectly adapted for its intended purpose, but in order to be used as a food for man it must be handled and kept until used, and it is during the handling and storage that damage occurs. Because of its easily assimilable nutriment it forms a favorable medium for the growth of minute plants or germs known as bacteria, and it is from these that the great danger arises. The germs gain access during the milking process, and in the subsequent handling and at ordinary temperatures they multiply with great rapidity. These bacteria are, under ordinary conditions, productive of harm chiefly when they are present in excessive numbers in milk used for infant feeding. In exceptional cases milk may contain the specific germs of infectious diseases.

An excessive number of bacteria in milk is the chief cause of high infant mortality, while the specific germs, when present, are the cause of infectious diseases, and in many instances have caused severe epidemics of typhoid fever, scarlet fever, and diphtheria.

It is because of the potential danger in milk that it must be safeguarded by strict supervision and impartial enforcement of laws. Sanitarians everywhere and the public generally are awakening to the necessity for the adoption of measures for the proper protection of the people from impure, unclean milk, and especially for the prevention of the enormous waste of human life occurring during the first year of life.

The supervision of the milk supply presents greater difficulties than that of any other food. No other food in general use deteriorates so rapidly. In other foods the responsibility for spoiling can be brought home to the seller within a few hours after sale, while the householder who buys milk can not tell whether it is safe or not by its appearance alone. About the only qualities of which he is able to judge are whether it is of sufficient richness and sweetness. The far more dangerous quality, that of contamination by germs, can not be detected except by laboratory methods involving considerable time, and completed long after the milk from which the sample was taken has been consumed. The necessary steps to protect the public must therefore be

taken before the milk reaches them, and must begin at the source of supply on the farms and follow the product until it reaches the consumer.

Pittsburg consumes between 45,000 and 50,000 gallons of milk daily. More than three-fourths of this amount is shipped in by rail from points more or less distant from the city. Northeastern Ohio supplies the largest part, and of sections nearer the city, Washington county supplies most. The milk shipped by rail is received mostly by the larger dealers, who either retail it directly to consumers or act as wholesalers and supply the smaller retailers. Of the latter there are about 2,000 in the city, mostly groccerymen. About 10,000 gallons are supplied by dairymen in and adjacent to the the city, who sell it directly from wagons to the consumers.

It can be realized that the problem of inspection of the milk supply of the city is an exceedingly complex one, and to be thoroughly done requires a large force of inspectors, as it involves the inspection of 5,000 farms and dairies, the places of 2,000 dealers, wholesale and retail, together with the points of distribution at the creameries or collecting stations along the lines of the railroads and at the city receiving stations. The work of inspection properly begins at the farm, for, if improper methods are carried out in the beginning, no subsequent treatment can repair the damage.

During the present year the city has appointed two dairy inspectors whose special duties are to visit the dairies and farms for purposes of instruction and cooperation. These men have been selected with special reference to their fitness for the work. One is a veterinarian of exceptional training and experience, the other is a practical dairyman of twelve years' experience. Since they began their work a few months ago more than 500 dairies have been inspected and in the majority of cases improvement has followed. Each dairy visited is rated on a score card on which is noted the essential points in the production of good milk. The policy has been to point out defects in equipment and methods, but except in bad cases to insist at first only on the correction of easily remediable conditions. At practically every place visited the inspector has been cordially received and the dairyman has shown a spirit of appreciation and cooperation.

Practicability, not theory, must be the basis for improved methods. The dairyman is not in the business for sentiment; the law of supply and demand, of profit and loss, governs him as in other lines of business. But here also, as in other lines of business, improved methods and equipment are more profitable than slipshod, slovenly methods and poor equipment, and upon this fact must be based our hope for the future.

LIST OF EXHIBITIONS.

On the following page is a tabular statement showing the most important facts relating to all the competitive exhibitions held in cooperation with the Dairy Division.

TABLE 4.—List of milk, cream, and dairy-farm contests held in cooperation with the Dairy Division.

Name and place.	Date.	Product.	Number of entries.	Average score.
National Dairy Show, Chicago, Ill.....	Feb. 15, 1906..	Market milk.....	23	89.7
		Market cream.....	14	93.6
		Certified milk.....	8	94.8
Granite State Dairymen's Association, Peterboro, N. H.	Dec. 6-7, 1906..	Market milk.....	11	90.8
		Market cream.....	9	91.4
City milk contest, Cleveland, Ohio.....	Mar. 16, 1907..	Market milk.....	53	90.3
		Market cream.....	6	88.5
		Dairy farms.....	25	64.1
Granite State Dairymen's Association, Whitefield, N. H.	Dec. 5-6, 1907..	Market milk.....	4	83.2
		Market cream.....	6	89.4
State Dairymen's Association, Marengo, Ill.....	Jan. 13-15, 1908..	Market milk.....	6	93.2
		Market cream.....	2	93.5
Pennsylvania State Dairy Union, Wilkes-Barre, Pa.	Jan. 14-16, 1908..	Market milk.....	10	91.9
		Certified milk.....	4	95.8
State Dairymen's Association, Columbus, Ohio....	Feb. 12-14, 1908..	Market milk.....	10	89.9
		Market cream.....	12	90.0
State Dairymen's Association, Battle Creek, Mich.	Feb. 19-21, 1908..	Market milk.....	5	95.5
		Market cream.....	4	94.4
City milk contest, Cleveland, Ohio.....	Mar. 7, 1908...	Market milk.....	38	88.5
		Market cream.....	6	90.5
State Dairymen's Association, Traverse City, Mich.	Mar. 11, 1908...	Market milk.....	10	91.1
		Market milk.....	50	85.2
City milk contest, Pittsburg, Pa.....	Oct. 22, 1908...	Market cream.....	8	77.7
		Dairy farms.....	12	63.6
		Market milk.....	30	85.7
National Dairy Show, Chicago, Ill.....	Dec. 2-10, 1908..	Market cream.....	20	83.8
		Certified milk.....	14	90.2
		Certified cream.....	6	85.9
State Dairymen's Association, Dexter, Me.....	Dec. 8-10, 1908..	Market milk.....	39	91.6
		Market cream.....	31	88.6
State Dairymen's Association, Burlington, Vt....	Jan. 6, 1909...	Market milk.....	29	90.6
		Market cream.....	16	81.3
Granite State Dairymen's Association, Contoocook, N. H.	Jan. 13-14, 1909..	Market milk.....	5	92.5
		Market cream.....	7	90.4
City milk contest, Columbus, Ohio.....	Feb. 5, 1909...	Market milk.....	15	91.8
		Market cream.....	7	92.3
State Dairymen's Association, Grand Rapids, Mich.	Feb. 17-19, 1909..	Market milk.....	6	81.1
		Market cream.....	4	95.2
City milk contest, Toledo, Ohio.....	Feb. 27, 1909...	Market milk.....	7	90.8
		Market cream.....	5	86.0
Kentucky Dairy Cattle Club, Lexington, Ky....	Mar. 13, 1909...	Market milk.....	4	94.2
Michigan Dairymen's and Grand Traverse Dairymen's Associations, Traverse City, Mich.	Mar. 25, 1909...	Market milk.....	6	93.5

REVISED SCORE CARD FOR DAIRY FARMS.

The following is the latest and simplest form of score card used by the Dairy Division in the rating of farm dairies:

[Front of card.]

[United States Department of Agriculture, Bureau of Animal Industry, Dairy Division.]

SANITARY INSPECTION OF DAIRIES.

DAIRY SCORE CARD.

[Adopted by the Official Dairy Instructors' Association. Subject to revision at future meetings.]

Owner or lessee of farm _____.
 P. O. address _____. State _____.
 Total number of cows _____. Number milking _____.
 Gallons of milk produced daily _____.
 Product is retailed by producer in _____.
 Sold at wholesale to _____.
 For milk supply of _____.
 Permit No. _____. Date of inspection _____, 19____.
 Remarks _____.

(Signed) _____, Inspector.

[Back of card.]

DETAILED SCORE.

Equipment.	Score.		Methods.	Score.	
	Perfect.	Allowed.		Perfect.	Allowed.
COWS.					
Health.....	6	.....	Cleanliness of cows.....	8	.....
Apparently in good health. 1					
If tested with tuberculin					
once a year and no tuber-					
culosis is found, or if					
tested once in six months					
and all reacting animals					
removed..... 5					
(If tested only once a year					
and reacting animals found					
and removed, 2.)					
Comfort.....	2	.....		
Bedding..... 1					
Temperature of stable..... 1					
Food (clean and wholesome).....	2	.....		
Water.....	2	.....		
Clean and fresh..... 1					
Convenient and abundant 1					
STABLES.					
Location of stable.....	2	.....		
Well drained..... 1					
Free from contaminating					
surroundings..... 1					
Construction of stable.....	4	.....		
Tight, sound floor and					
proper gutter..... 2					
Smooth, tight walls and					
ceiling..... 1					
Proper stall, tie, and man-					
ger..... 1					
Light: Four sq. ft. of glass per					
cow.....	4	.....		
(Three sq. ft., 3; 2 sq. ft., 2;					
1 sq. ft., 1. Deduct for uneven					
distribution.)					
Ventilation: Automatic sys-					
tem.....	3	.....		
(Adjustable windows, 1.)					
Cubic feet of space for cow: 500					
to 1,000 feet.....	3	.....		
(Less than 500 feet, 2; less					
than 400 feet, 1; less than 300					
feet, 0; over 1,000 feet, 0.)					
UTENSILS.					
Construction and condition of					
utensils.....	1	.....		
Water for cleaning.....	1	.....		
(Clean, convenient, and					
abundant.)					
Small-top milking pail.....	3	.....		
Facilities for hot water or					
steam.....	1	.....		
(Should be in milk house,					
not in kitchen.)					
Milk cooler.....	1	.....		
Clean milking suits.....	1	.....		
MILK ROOM.					
Location of milk room.....	2	.....		
Free from contaminating					
surroundings..... 1					
Convenient..... 1					
Construction of milk room.....	2	.....		
Floor, walls, and ceiling... 1					
Light, ventilation, screens 1					
Total.....	40	.....	Total.....	60	.....
COWS.					
			Cleanliness of cows.....	8	.....
			STABLES.		
			Cleanliness of stables.....	6	.....
			Floor..... 2		
			Walls..... 1		
			Ceiling and ledges..... 1		
			Mangers and partitions.. 1		
			Windows..... 1		
			Stable air at milking time.....	6	.....
			Barnyard clean and well		
			drained.....	2	.....
			Removal of manure daily to		
			field or proper pit.....	2	.....
			(To 50 feet from stable, 1.)		
			MILK ROOM.		
			Cleanliness of milk room.....	3	.....
			UTENSILS AND MILKING.		
			Care and cleanliness of uten-		
			sils.....	8	.....
			Thoroughly washed and		
			sterilized in live steam for		
			30 minutes..... 5		
			(Thoroughly washed and		
			placed over steam jet, 4; thor-		
			oughly washed and scalded		
			with boiling water, 3; thor-		
			oughly washed, not scalded,		
			2.)		
			Inverted in pure air..... 3		
			Cleanliness of milking.....	9	.....
			Clean, dry hands..... 3		
			Udders washed and dried. 6		
			(Udders cleaned with moist		
			cloth, 4; cleaned with dry		
			cloth at least 15 minutes be-		
			fore milking, 1.)		
			HANDLING THE MILK.		
			Cleanliness of attendants.....	1	.....
			Milk removed immediately		
			from stable.....	2	.....
			Prompt cooling (cooled im-		
			mediately after milking		
			each cow).....	2	.....
			Efficient cooling; below 50° F.		
			(51° to 55°, 4; 56° to 60°, 2.)	5	.....
			Storage; below 50° F.....		
			(51° to 55°, 2; 56° to 60°, 1.)	3	.....
			Transportation; iced in sum-		
			mer.....	3	.....
			(For jacket or wet blanket		
			allow 2; dry blanket or cov-		
			ered wagon, 1.)		

Score for equipment..... + Score for methods..... = Final score.

NOTE 1.—If any filthy condition is found, particularly dirty utensils, the total score shall be limited to 49.

NOTE 2.—If the water is exposed to dangerous contamination or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.